



SECOND BIGEYE TUNA MANAGEMENT WORKSHOP (BMW02)

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CONSIDERATIONS FOR YELLOWFIN TUNA UNDER THE MIXED FISHERY APPROACH

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SPC-OFP¹

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1 Introduction

Under the WCPFC mixed fishery framework, there is no management procedure (MP) that explicitly considers the stock status of yellowfin and manages the associated fisheries. Instead, the fisheries that catch yellowfin are primarily managed through the MPs of skipjack, South Pacific albacore and bigeye. An interim skipjack MP was adopted in 2022 (WCPFC, 2022) and an interim South Pacific albacore MP was adopted in 2025 (WCPFC, 2025). The bigeye MP is scheduled for adoption in 2026.

The details of the bigeye MP have not yet been decided, but will ultimately impact fisheries that catch yellowfin. The bigeye MP output will change both the tropical longline (TLL) effort level and the ratio of PS effort allocated between associated and free-school sets which can impact the yellowfin stock level. Therefore, yellowfin projections under different bigeye MP designs were presented at SC22 to aid the decision-making process for the bigeye MP. The projections were based on a subset of MP designs using the “TLL including Hawaiian longline fleet” spatial scenario with contrasting target reference points (TRPs) and harvest control rule (HCR) pairs.

At SC22, the SSP was requested to expand the uncertainty range of the bigeye OM grid, which resulted in new MP designs. Consequently, the prescribed fishing levels under each MP are now different to those presented at SC22. Due to the abundance of MP design options available for consideration by BMW02, the new MPs have not been implemented in the yellowfin projections presented in this paper. However, similar MP designs will likely produce similar outcomes for the yellowfin stock. Additional yellowfin projections can be run on a subset of the new bigeye MPs before the bigeye MP is due for adoption at WCPFC23.

This paper provides a brief and targeted overview of the relevant yellowfin outcomes as they relate to the bigeye MP. The projections presented here corroborate previous analyses (TT-CMM (SPC-OFP, 2025)) which indicated it may not be possible to achieve current management objectives for bigeye and yellowfin simultaneously.

BMW02 is invited to:

- note that current management objectives for yellowfin may not be achieved for the range of bigeye TRPs currently under consideration;
- note that updated results will be provided to the Commission for the refined subset of bigeye MP scenarios identified by BMW02.

2 Methods

2.1 Operating models

SC22 agreed to adopt the YFT OM grid that was constructed around the 2023 yellowfin stock assessment grid, consistent with the approach used for the other key tuna species. The OMs for

yellowfin incorporate uncertainty in growth, natural mortality, steepness, tag mixing period, recruitment variation and effort creep.

2.2 Projection framework

SC22 also supported the YFT MSE framework. Given the numerous aspects of the bigeye MP to still be agreed, evaluations were conducted for a reduced subset of MP designs to demonstrate stock outcomes under plausible yet contrasting MP options. Projections were conducted for the “TLL including Hawaiian longline fleet” bigeye scenario, for which the bigeye MP controls all of the TLL fisheries. The four illustrative bigeye MP scenarios are described in Table 1.

Table 1: *Bigeye MP scenarios defining fishing levels for tropical longline in the yellowfin projections under the “TLL including Hawaiian longline fleet” spatial scenario.*

Bigeye MP	HCR pair	Target reference point	Threshold %
13	FAD favoured	$0.94 \times SB/SB_{2012-2015}$	50%
13	longline favoured	$0.94 \times SB/SB_{2012-2015}$	50%
18	FAD favoured	$1.06 \times SB/SB_{2012-2015}$	70%
18	longline favoured	$1.06 \times SB/SB_{2012-2015}$	70%

2.3 Performance Indicators

Relative performance of the candidate bigeye MPs is evaluated by comparing calculated performance indicators. The results were evaluated against the same performance indicators used for bigeye tuna, with yellowfin-specific changes where necessary:

1. Stock status ($SB/SB_{F=0}$) in the WCPO, (measured as $SB_{\text{latest}}/SB_{F=0}$, i.e. SB in year y relative to the average $SB_{F=0}$ in years $y-10$ to $y-1$);
2. Probability that $SB/SB_{F=0}$ is above the Target Reference Point (calculated as the average spawning biomass depletion ratio for the period 2012 to 2015);
3. Probability that $SB/SB_{F=0}$ is above the Limit Reference Point, noting that the WCPFC requires the probability to be greater than 0.8;
4. Expected yellowfin catch, reported separately for longline and purse seine;
5. Expected vulnerable biomass, as a proxy for catch rates, reported separately for longline and purse seine. Here it is calculated as relative to the average vulnerable biomass in the period 2019-2021.
6. Catch variability, reported separately for longline and purse seine;
7. Effort variability, reported separately for longline and purse seine;
8. F relative to F_{MSY} ; and
9. MSY.

Performance indicators for effort variability and MSY are not yet available, pending ongoing development of the MSE framework, but will be developed and presented for future analyses.

Where performance indicators are presented separately for longline and purse seine fisheries, the longline results relate to all longline fisheries in the WCPO and purse seine results relate to all purse seine (FAD-associated and free school) fisheries in the WCPO.

3 Results

Supporting figures and tables for the following key results can be found in [Wickens et al. \(2026\)](#), presented at SC22. We reiterate that these were developed based upon the outcomes from analyses based upon the bigeye OM grid at that time. SC22 results are described in general terms below. As a new bigeye OM grid has been developed based upon SC22's request, these results for yellowfin will change.

Stock status

The MPs designed for bigeye to hit the lower TRP (i.e., higher longline effort) result in a more depleted yellowfin stock.

Probability above the LRP and TRP

Under the TT-CMM, the current management objective for yellowfin tuna is to maintain the stock around the average spawning biomass depletion ratio from 2012 to 2015. Noting that recent analyses indicate that it may not be possible to achieve this management objective simultaneously for both bigeye and yellowfin, the probability of the yellowfin stock status being above the target was between 9% and 25% across the illustrative MPs.

The subset of bigeye MPs used in the projections resulted in a probability of the yellowfin stock being above the LRP of at least 95%.

Longline catch and catch variability

There is a clear difference between the expected longline catches of yellowfin under bigeye MPs designed to achieve either the upper or lower bigeye TRP. For the lower TRP scenarios, longline catches of yellowfin are significantly higher due to the substantial increase in longline effort allowed under those MPs. We note these projected yellowfin longline catches are greater than any historical catch observed in the fishery.

When operating under effort controls with a relatively stable stock status, catch variability scales with catch. For this reason, the MPs designed for bigeye to achieve its lower TRP result in higher catch variability.

Purse seine catch and catch variability

Under the alternative MPs there is relatively little change in the yellowfin vulnerable biomass for purse seine fisheries. The differences between purse seine catch variability was also minimal. The variability was slightly lower under the MPs with a longline favoured HCR pair.

Vulnerable biomass

Under the tested bigeye MPs, the expected future vulnerable biomass is lower than the 2019-2021 average level for both the longline fisheries managed through the bigeye MP and the purse seine fisheries. The purse seine fishery selects smaller individuals, whereas the longline fishery selects larger individuals (Scott et al., 2026), giving rise to the differences in expected vulnerable biomass between these fisheries. The vulnerable biomass is slightly lower for the MPs designed for bigeye to achieve the lower TRP.

3.1 Conclusions

Outcomes for yellowfin tuna will be updated when a refined subset of bigeye MP scenarios has been identified so the conclusions from these preliminary analyses are subject to change. Nevertheless, the evaluations show:

- the stock of yellowfin tuna is expected to remain above the LRP with greater than 80% probability;
- the management objective of maintaining the yellowfin stock around 2012-2015 average depletion levels cannot be met;
- for longline fisheries, the choice of bigeye TRP had the greatest impact on expected catches of yellowfin, with longline or FAD favoured HCRs having lesser impact;
- catches of yellowfin in purse seine fisheries were more stable, but are slightly higher for the upper bigeye TRP option.

These preliminary evaluations demonstrate that the proposed WCPFC mixed fishery harvest strategy approach is expected to maintain the stock of yellowfin tuna within safe biological limits. However the current management objective to maintain the stock around the 2012-2015 average depletion level cannot be achieved.

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Declaration of generative AI and AI-assisted technologies

No AI technologies were used in the preparation of this paper.

4 References

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